

CONNECTICUT RIVER BASIN
ENFIELD, NEW HAMPSHIRE

BALTIC MILLS DAM
NH 00273

STATE NO 077.02

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

FEBRUARY 1979

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The dam has a hydraulic height of 17 ft. and is 120 ft. long. It is a run of the river, concrete, gravity dam with a 14 ft. high by 96 ft. long ogee spill- way flanked by vertical end walls. The dam is in fair condition. Deterioration of concrete in gate structure and dam near north abutment was noted. It is small in size with a significant hazard potential. A major breach at top of dam could not result in any loss of life but could cause appreciable property damage.		



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:

NEDED

SEP 17 1979

Honorable Hugh J. Gallen
Governor of the State of New Hampshire
State House
Concord, New Hampshire 03301

Dear Governor Gallen:

I am forwarding to you a copy of the Baltic Mills Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Water Resources Board, the cooperating agency for the State of New Hampshire. In addition, a copy of the report has also been furnished the owner, Mr. Warren H. Taylor, R.F.D., Rutland, Vermont 05701.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Water Resources Board for your cooperation in carrying out this program.

Sincerely,

Incl
As stated

MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.: NH00273
Name of Dam: Baltic Mills Dam
Town: Enfield
County and State: Grafton County, New Hampshire
River: Mascoma River
Date of Inspection: November 8, 1978

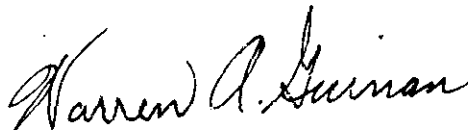
BRIEF ASSESSMENT

Baltic Mills Dam has a hydraulic height of 17 feet, is of varied topwidth, and is 120 feet long. It is a run-of-the-river, concrete, gravity dam with a 14-foot high by 96-foot long ogee spillway flanked by vertical end walls. A 4-foot low-level drain gate is located in the north abutment. The dam spans a reach of the Mascoma River, and is located in west-central New Hampshire. Maximum storage capacity is about 120 acre-feet. The upstream pond is 1.8 miles in length with a surface area of 20 acres.

The dam is in fair condition. Major concerns are: deterioration of concrete in gate structure and dam near north abutment; cracking of concrete training wall at south end of spillway; and spalling in the joint between the spillway and north abutment.

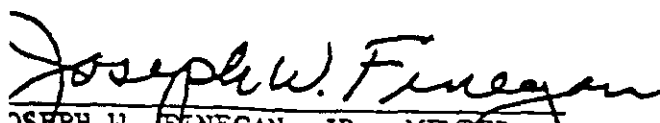
Based on small size and significant hazard potential classifications in accordance with Corps guidelines, the test flood is $\frac{1}{4}$ Probable Maximum Flood (PMF). A $\frac{1}{4}$ PMF outflow of 16,055 cfs (about 124 csm) would overtop the dam by 6.9 feet (10.4 feet over spillway crest). The spillway will pass 2,326 cfs or about 14 percent of the test flood. A major breach at top of dam probably would not result in any loss of life but could cause appreciable property damage.

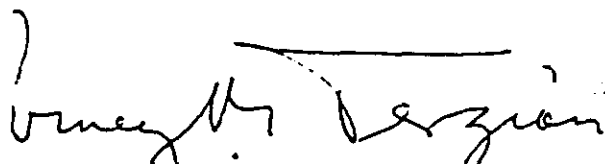
The owner, Mr. Warren H. Taylor, should implement the results of the recommendations and remedial measures given in Sections 7.2 and 7.3, respectively, within one year after receipt of this Phase I inspection report.

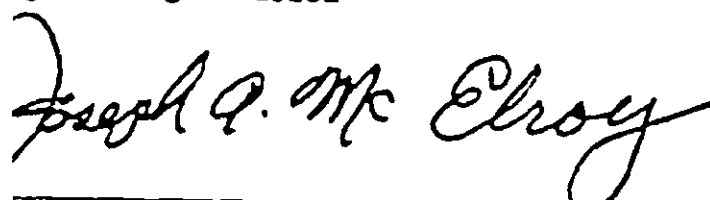


Warren A. Guinan
Project Manager
N.H. P.E. 2339

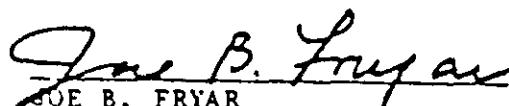
is Phase I Inspection Report on Baltic Mills Dam
s been reviewed by the undersigned Review Board members. In our
inion, the reported findings, conclusions, and recommendations are
asistent with the Recommended Guidelines for Safety Inspection of
ms, and with good engineering judgement and practice, and is hereby
bmitted for approval.


JOSEPH W. FINEGAN, JR., MEMBER
ater Control Branch
ngineering Division


ARNEY M. TERZIAN, MEMBER
esign Branch
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JOSEPH A. MCELROY, CHAIRMAN
hief, NED Materials Testing Lab.
oundations & Materials Branch
ngineering Division

APPROVAL RECOMMENDED:


JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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Figure 1 - Overview of Baltic Mills Dam.



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SCALE IN MILES



BASED ON STATE OF NEW HAMPSHIRE
AL HIGHWAY MAP.

Anderson-Nichols & Co, Inc.		U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	
CONCORD	NEW HAMPSHIRE		
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS			
BALTIC MILLS DAM LOCATION MAP			
MASCOMA RIVER		NEW HAMPSHIRE	
		SCALE: SEE BAR SCALE	
		DATE: FEBRUARY 1979	

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
BALTIMIC MILLS DAM

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Anderson-Nichols & Company, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of New Hampshire. Authorization and notice to proceed were issued to Anderson-Nichols & Company, Inc. under a letter of November 20, 1978 from Max B. Scheider, Colonel, Corps of Engineers. Contract No. DACW33-79-C-0009 has been assigned by the Corps of Engineers for this work.

b. Purpose

- (1) To perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.
- (2) To encourage and prepare the states to initiate quickly effective dam safety programs for non-Federal dams.
- (3) To update, verify, and complete the National Inventory of Dams.

1.2 Description of Project

a. Location. Baltic Mills Dam is located in the Town of Enfield, New Hampshire. This run-of-the-river dam spans the Mascoma River, a major tributary of the Connecticut River. Baltic Mills Dam is about 14 miles above the confluence of the Mascoma and Connecticut Rivers and about 1 mile upstream of Mascoma Lake. The dam is shown on U.S.G.S. Quadrangle, Mascoma, New Hampshire - Vermont with coordinates approximately N 43° 38' 36", W 72° 08' 06", Grafton County, New Hampshire. (See Location Map page vii.)

b. Description of Dam and Appurtenances. Baltic Mills Dam is a run-of-the-river concrete gravity dam that totals 120 feet in length. The dam consists of a concrete ogee spillway 96 feet long, a north abutment 6 feet long which includes the mechanical lifting mechanisms and a 4' x 4' gate, and a south abutment 18 feet long which includes a concrete training wall and earth and rockfill. A railroad bed lies beyond the earth and rockfill. Beyond the railroad bed, natural ground continues on a 2H:1V slope. The mill building is located just beyond the north abutment and contains an inlet structure which once served the power equipment. A tailrace exits from the building approximately 20 feet downstream of the dam.

c. Size Classification. Small (hydraulic height - 17 feet, storage - 120 acre-feet), based on a height and storage (< 40 feet and \geq 50 to < 1000 acre-feet), respectively, as given in the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification. Significant Hazard. A major breach in the dam probably would not result in any loss of life but could cause appreciable property damage. (See Section 5.1 f.)

e. Ownership. Baltic Mills Dam is reported to have been built around 1919 by the American Woolen Company. Ownership passed onto Mr. Warren H. Taylor in 1978.

f. Operator. The current owner and operator of Baltic Mills Dam is Mr. Warren H. Taylor, R.F.D., Rutland, Vermont, 05 Phone: (802) 775-5327.

g. Purpose of Dam. The dam impounding the Mascoma River was originally constructed to provide industrial water storage for use in hydropower production for the American Woolen Company located in Enfield, New Hampshire.

h. Design and Construction History. No information was found concerning the design and construction of the dam.

i. Normal Operational Procedures. No operation and maintenance procedures were disclosed.

1.3 Pertinent Data

a. Drainage Area. The drainage area consists of 130 square miles (83,200 acres) of rolling, predominantly wooded terrain.

b. Discharge at Damsite

(1) Outlet works (gated outlet) - 4-foot low-level outlet, invert elevation 779.3' MSL. Gate capacity at top of dam - 348 cfs @ elevation 796.3' MSL.

(2) The maximum discharge at damsite - a U.S.G.S. gaging station with a drainage area of 153 square miles is located on the Mascoma River near Mascoma, New Hampshire. A maximum discharge of 5840 cfs was recorded at this gaging station during the March 1936 flood. Using this figure, the maximum discharge at damsite can be interpolated to have been about 5,170 cfs.

(3) Ungated spillway capacity @ top of dam - 2,326 cfs @ 796.3' MSL.

(4) Ungated spillway capacity @ test flood elevation - 12,560 cfs @ 803.2' MSL.

(5) Gated spillway capacity @ top of dam - not applicable.

(6) Gated spillway capacity @ test flood elevation - not applicable.

(7) Total spillway capacity @ test flood elevation - 12,560 cfs @ 803.2' MSL.

(8) Total project discharge @ test flood elevation - 16,055 cfs @ 803.2' MSL.

c. Elevation. (feet above MSL based on a spillway crest elevation of 792.8 recorded in 1938 during a "New Hampshire Water Commission Data for Dams in New Hampshire" survey.)

(1) Streambed at centerline of dam - 778.9 (downstream toe)

(2) Maximum tailwater - with an estimated maximum discharge of 5,170 cfs during the March 1936 flood, maximum tailwater could be estimated to have been 785' MSL.

(3) Low-level outlet upstream invert - 779.3

(4) Recreation pool - not applicable

(5) Full flood control pool - not applicable

(6) Spillway crest - 792.8

- (7) Design surcharge (Original Design) - unknown
- (8) Top of dam - 796.3
- (9) Test flood pool - 803.2

d. Reservoir (miles)

- (1) Length of maximum pool - 2.4
- (2) Length of recreation pool - not applicable
- (3) Length of flood control pool - not applicable
- (4) Length of spillway crest pool - 1.8

e. Storage (acre-feet)

- (1) Recreation pool - not applicable
- (2) Flood control pool - not applicable
- (3) Spillway crest pool - 105 (approximate)
- (4) Top of dam - 120 (approximate)
- (5) Test flood pool - 340 (approximate)

f. Reservoir Surface (acres)

- (1) Recreation pool - not applicable
- (2) Flood control pool - not applicable
- (3) Spillway crest pool - 20 (approximate)
- (4) Test flood pool - 38 (approximate)
- (5) Top of dam pool - 28 (approximate)

g. Dam

- (1) Type - run-of-the-river; concrete, ogee shaped spillway
- (2) Length - 120'
- (3) Height - 21' (structural height)
- (4) Topwidth - approximately 1' (spillway)

- (5) Sideslope - vertical upstream; ogee downstream
- (6) Zoning - not applicable
- (7) Impervious core - not applicable
- (8) Cutoff - unknown
- (9) Grout curtain - unknown

h. Diversion and Regulating Tunnel. Not applicable.
(See j. below.)

i. Spillway

- (1) Type - ungated (run-of-the-river)
- (2) Length of weir - 96'
- (3) Crest elevation - 792.8' MSL
- (4) Gates - none

(5) U/S Channel - Immediately upstream of the dam, the Mascoma River ranges in width from 120 feet to 180 feet. The banks are covered with brush and some trees. The Boston & Maine Railroad runs along the south overbank while the north overbank is lined with mill buildings.

(6) D/S Channel - The channel downstream was not visible beneath the tailwater surface. The banks are lightly covered with trees and brush. The bottom of the south bank is lined with dumped riprap, and mill buildings occupy the north bank.

j. Regulating Outlets. A 4-foot gate is located in the north abutment and is used only to drain the pond. The lifting mechanism appears to be operable.

SECTION 2 ENGINEERING DATA

2.1 Design

No original design data were disclosed for Baltic Mills Dam.

2.2 Construction

No construction data were disclosed for Baltic Mills Dam.

2.3 Operation

No engineering operational data were disclosed.

2.4 Evaluation

a. Availability. Little engineering data were disclosed for Baltic Mills Dam. A search of the files of the NHWRB revealed only a limited amount of recorded information.

b. Adequacy. Because of the limited amount of detailed data available, the final assessments and recommendations of this investigation are based on visual inspection and hydrologic and hydraulic calculations.

c. Validity. There was no engineering information disclosed to review or evaluate.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General. Baltic Mills Dam is a low, run-of-river dam which impounds a reservoir of small size. At the time of the inspection, water was flowing over the crest of the dam. The south abutment of the dam was accessible for inspection. The north abutment of the dam is under an old mill building.

b. Dam. Baltic Mills Dam is a concrete-gravity dam with an ogee downstream face about 17 feet high and a spillway section about 96 feet long. (See Appendix C - Figure 2.) At the time of the inspection, several inches of water were flowing over the crest of the dam. To the extent that the downstream face of the dam was visible beneath the water flowing over the dam, no obvious defects were observed in the concrete. The upstream face of the dam was not visible beneath the reservoir surface.

At the south end of the dam a concrete training wall extends upstream and downstream from the dam. The training wall is cracked in several places. (See Appendix C - Figure 3.) Between this training wall and the natural ground of the south abutment is a dumped rockfill which consists of boulders ranging from 2 to 4 feet in length. (See Appendix C - Figure 4.) A small amount of sand-and-gravel-sized crushed rock has been dumped on part of the surface of the rock fill. The rockfill has little or no vegetation on its surface.

Beyond the south abutment is a railroad which runs along the valley. Available records indicate that the rockfill embankment between the dam and the railroad was "badly washed away" during a flood in September 1938. It appears that rockfill was placed to repair the eroded part of the embankment. No seepage was observed at the south abutment.

The north abutment of the dam was accessible on a subsequent inspection. The concrete in the gate structure and in the dam itself near the north abutment is badly deteriorated. (See Appendix C - Figures 5 and 6.)

The bottom of the channel downstream of the dam was not visible beneath the tailwater and no other information is available in the records to indicate the type of material

on which the dam is founded. One photograph in the available records shows a cutoff trench.

c. Appurtenant Structures. The outlet works are located on the north abutment and are an integral part of the dam and the adjacent building. (See Appendix C - Figure 6.) The concrete surfaces of the outlet works have spalled up to 2 inches in depth. Cracks and effloresced areas in partial contact with water show the most erosion. One large piece (approximately 1 cy) of concrete was observed lying on the downstream apron. Visual inspection did not determine the concrete's original location. The condition of the gate could not be determined. However, some leakage was observed at the downstream outlet. The mechanical gate operating mechanism was in fair condition.

The adjacent building and generating facilities were inspected upon a subsequent visit when the owner was present and found to be essentially intact but not operating.

d. Reservoir Area. The drainage area above the dam is rolling and is generally forested, except on the valley bottom and some of the flatter adjacent slopes. A number of swamps and lakes are located on tributaries of the Mascoma River upstream of Baltic Mills Dam.

It was not possible to see below the reservoir surface to determine how much silt had accumulated in the reservoir behind the dam.

A railroad bridge crosses the reservoir east of the dam, about 300 feet upstream. (See Appendix C - Figure 7.)

e. Downstream Channel. The channel immediately downstream of the dam is wide and unobstructed. (See Appendix C - Figure 8.) Boulders are exposed in the channel bottom, but it was not possible to determine visually whether the downstream channel invert was primarily bedrock or soil.

3.2 Evaluation

Based on the visual inspection, the Baltic Mills Dam is in fair condition. The concrete surfaces of the gate structure and dam near the north abutment are badly deteriorated.

To the extent that it was visible beneath the overflowing water, the main section of the concrete dam exhibited only one obvious defect which is discussed in the following paragraph. Otherwise, the dam appeared to be in good condition. This tentative evaluation should be verified by an inspection of the dam when no water is flowing over the crest.

The north abutment of the dam was not accessible because it is beneath the mill building on the north side of the valley. However, at the spillway and north abutment joint, an apparent crack, observed through binoculars, was noted. It appears to be about 2 inches wide and extends from the crest to the toe. This apparent crack was later determined to be a joint. Some of the concrete on the downstream side has spalled.

The training wall at the south end of the dam is cracked in several places.

The earthen embankment section between the south end of the dam and the south abutment could be susceptible to erosion, because of a lack of vegetation. No seepage discharge was observed at the south abutment.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures

The Baltic Mills Dam is not under any operational procedures at present. The owner has indicated that he may use the water wheel in the future.

4.2 Maintenance of Dam

Baltic Mills Dam is maintained by the owner, Warren H. Taylor, R.F.D., Rutland, Vermont, 05701.

4.3 Maintenance of Operating Facilities

The drain gate is used only during the draining of the pond.

4.4 Description of Any Warning System in Effect

No warning system exists for the Baltic Mills Dam.

4.5 Evaluation

Because the dam serves only as a barrier at present, operational procedures do not apply.

SECTION 5
HYDROLOGIC AND HYDRAULIC ANALYSIS

5.1 Evaluation of Features

a. General. Baltic Mills Dam is a run-of-the-river, low, concrete gravity dam which impounds a reservoir of small size. The total length of the dam is about 120 feet, 96 feet of which consists of an ogee spillway. The top of the dam is 3.5 feet above the spillway crest. The dam withstood some overtopping without failure of the main spillway as evidenced by the flood of March 1936, when the estimated discharge at the damsite was 5170 cfs. However, embankment erosion on the south bank downstream required repair.

b. Design Data. No original hydrologic or hydraulic design data were found.

c. Experience Data. The south abutment was overtopped during the September 21-24, 1938 flood. The embankment between the dam and railroad was reported to have been badly washed away. This information was found in the NHWRB files and was obtained, during a survey taken after the flood, by the State of New Hampshire Water Control Commission, predecessor agency to the NHWRB.

d. Visual Inspection. Evidence of overtopping of the south abutment confirmed that which was reported to the Water Control Commission in 1938. No other visual evidence of damage to the structure caused by overtopping was found at the time of inspection.

e. Test Flood Analysis. Baltic Mills Dam is classified as being small in size, having a maximum storage of 120 acre-feet and a hydraulic height of 17 feet. Using the Recommended Guidelines for Safety Inspection of Dams, the test flood was determined to be $\frac{1}{4}$ the Probable Maximum Flood (PMF). The test flood discharge for Baltic Mills Dam, having a drainage area of 130 square miles, was determined to be 16,055 cfs. The overtopping analysis indicates that the water depth over the dam during the test flood would be 6.9 feet (10.4 feet over spillway crest). The spillway capacity at maximum pool is 2,326 cfs which is only 14 percent of the test flood discharge.

f. Dam Failure Analysis. To determine the hazard classification for Baltic Mills Dam, the impact of failure of the dam at top of dam was assessed using Guidance for

Estimating Downstream Dam Failure Hydrographs issued by the Corps of Engineers. The analysis covered the reach extending from the dam to the first bridge downstream, a distance of about 1300 feet. Failure of Baltic Mills Dam at top of dam would result in an increase in stage of 2.4 feet along this reach in addition to the 4.6-foot high antecedent conditions. An increase of this magnitude probably would not result in the loss of any life but could cause appreciable property damage in the vicinity of the first bridge downstream. As a result of the analysis described above, Baltic Mills Dam was classified - Significant Hazard.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. The following potential stability problems were noted during the visual inspection.

(1) Deterioration of the concrete in the gate structure, the dam itself near the north abutment, and spalling in the joints, especially at the north end of the spillway and abutment.

(2) Cracking of the training wall at the south end of the concrete spillway section of the dam.

(3) Lack of vegetation and uncertainty about the cross section of embankment section of dam, and consequent potential for erosion if the embankment is overtopped.

b. Design and Construction Data. No design and construction data were disclosed.

c. Operating Records. No operating records were disclosed.

d. Post-Construction Changes. One photograph in the available records is labeled "sill and sheet piling, old dam," which would imply that there was a dam at this site prior to the construction of the present dam in 1918 and 1919.

A memorandum, dated October 1978, indicates that a new generator had been installed and that renovations to the gatehouse were in progress. At the subsequent visit when the owner was present, the only installed equipment noted was a horizontal water wheel, intake and draft tube. No generator has been installed, nor was one present in the building. The owner, by letter in January 1979, indicated that no generator had been connected. (See Appendix B.)

e. Seismic Stability. This dam is in Seismic Zone 2 and in accordance with the recommended Phase I guidelines does not warrant seismic analysis.

SECTION 7
ASSESSMENT, RECOMMENDATIONS, & REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. The visual inspection indicates that Baltic Mills Dam is in fair condition. The major concerns with respect to the integrity of the dam are:

(1) Deterioration of the concrete in the gate structure and in the dam itself near the north abutment.

(2) Cracking of the training wall at the south end of the concrete section of the dam.

(3) Lack of vegetation and uncertainty about the cross section of the embankment section of the dam, and consequent potential for erosion if the embankment is overtopped.

(4) Spalling in the joint between concrete spillway and north abutment.

b. Adequacy of Information. The information available is such that the assessment must be based primarily on the visual inspection.

c. Urgency. The recommendations and remedial measures made in 7.2 and 7.3 below should be implemented by the owner within one year after receipt of this Phase I inspection report.

d. Need for Additional Investigation. The dam should be inspected when no water is flowing over the crest, so that the concrete in the downstream face and crest of the dam can be examined. Also, the north abutment, spillway and north abutment joints and outlet works should be inspected in more detail at that time.

7.2 Recommendations

The owner should engage a Registered Professional Engineer to:

(1) Recommend repairs for the deteriorated concrete in the gate structure and the north end of the concrete section of the dam and for the cracked training wall at the south end of the concrete section of the dam.

(2) Evaluate the embankment at the south end of the dam with respect to erosion resistance if it should be overtopped, and to recommend remedial measures, if needed.

(3) Inspect the dam when no water is flowing over the crest and inspect the spillway and north abutment joint and that portion of the north abutment inside the mill building.

Repairs recommended by the engineer, including any repairs considered necessary on the basis of the additional inspection recommended in 7.2 (3) above, should be carried out by the owner.

7.3 Remedial Measures

a. Operating and Maintenance Procedures. The owner should:

(1) Verify that the low-level gate mechanism is operable.

(2) Establish a surveillance program for use during and immediately after heavy rainfall and also a warning system to follow in case of emergency conditions.

(3) Have the dam inspected by a Registered Professional Engineer once every year.

7.4 Alternatives

If the dam is not to be used, consideration should be given to removing it.

APPENDIX A
VISUAL INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT Baltic Mills Dam, N.H.

DATE November 8, 1978

TIME 1:00 PM

WEATHER Cool, Cloudy, 46°F

W.S. ELEV.	U.S.	DN.S.
	<u>793.1</u>	<u>778.9</u>

PARTY:

- | | |
|-----------------------------|------------------------------------|
| 1. <u>Robert Langen</u> | 6. <u>Warren Guinan (11/15/78)</u> |
| 2. <u>Stephen Gilman</u> | 7. _____ |
| 3. <u>Douglas Ford</u> | 8. _____ |
| 4. <u>Robert Ojendyk</u> | 9. _____ |
| 5. <u>Ronald Hirschfeld</u> | 10. _____ |

PROJECT FEATURE	INSPECTED BY	REMARKS
1. <u>Hydrology/Hydraulics</u>	<u>W. Guinan/D. Ford/R. Langen</u>	
2. <u>Soils and Geology</u>	<u>R. Hirschfeld</u>	
3. <u>Structural Stability</u>	<u>S. Gilman</u>	
4. _____		
5. _____		
6. _____		
7. _____		
8. _____		
9. _____		
10. _____		

PERIODIC INSPECTION CHECKLIST

PROJECT Baltic Mills Dam, N.H. DATE November 8, 1971

PROJECT FEATURE Dam Embankment NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
<u>DAM EMBANKMENT</u>	(Short embankment section between south end of concrete section and south abutment.)
Crest Elevation	792.8' MSL
Current Pool Elevation	793.1' MSL
Maximum Impoundment to Date	Unknown
Surface Cracks	None apparent
Pavement Condition	Not paved
Movement or Settlement of Crest	None apparent
Lateral Movement	None apparent
Vertical Alignment	Surface of dumped rock is very irregular
Horizontal Alignment	Good
Condition at Abutment and at Concrete Structures	Dumped rock placed between south abutment (railroad fill) and concrete training wall at south end of concrete overflow section.
Indications of Movement of Structural Items on Slopes	None apparent
Trespassing on Slopes	None apparent
Sloughing or Erosion of Slopes or Abutments	Dumped rock was apparently placed after a washout of the embankment section. Records indicate a washout in 1938. See "Sloughing or Erosion..." above.
Rock Slope Protection - Riprap Failures	None apparent
Unusual Movement or Cracking at or Near Toe	None apparent
Unusual Embankment or Downstream Seepage	None apparent
Piping or Boils	None apparent
Foundation Drainage Features	None apparent
Toe Drains	None apparent
Instrumentation System	None apparent
Vegetation	Some small trees growing on embankment

PERIODIC INSPECTION CHECKLIST

PROJECT Baltic Mills Dam, N.H. DATE November 8, 1978
 PROJECT FEATURE Intake Channel & Structure NAME _____
 DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE</u>	
1. Approach Channel	Not visible
Slope Conditions	Not applicable
Bottom Conditions	Not visible beneath reservoir surface.
Rock Slides or Falls	None
Log Boom	None
Debris	None
Condition of Concrete Lining	Not visible beneath reservoir surface.
Drains or Weep Holes	None apparent
2. Intake Structure	
Condition of Concrete	Not visible beneath reservoir surface.
Stop Logs and Slots	None Steel trash racks badly rusted (1-1½' section gone.)

PERIODIC INSPECTION CHECKLIST

PROJECT Baltic Mills Dam, N.H. DATE November 8, 1978

PROJECT FEATURE Outlet Works-Control Tower NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - CONTROL TOWER</u>	
a. Concrete and Structural	
General Condition	Fair - surface spalled up to 2" deep
Condition of Joints	Areas in partial contact with water have eroded, wall adjacent to bldg. badly spalled and deteriorated.
Spalling	No apparent movement
Visible Reinforcing	See General Condition
Rusting or Staining of Concrete	None apparent
Any Seepage or Efflorescence	None apparent
Joint Alignment	Yes - wide spread
Unusual Seepage or Leaks in Gate Chamber	None visible
Cracks	None visible
Rusting or Corrosion of Steel	None visible
b. Mechanical and Electrical	
Air Vents	Gates - not visible beneath reservoir surface, gate mechanism - fair condition - surface rusting
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System	

PERIODIC INSPECTION CHECKLIST

PROJECT Baltic Mills Dam, N.H. DATE November 8, 1978

PROJECT FEATURE Outlet Structure & Channel NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL</u>	
General Condition of Concrete	Visible portions of low-level channel badly deteriorated
Rust or Staining	None
Spalling	Yes
Erosion or Cavitation	Yes
Visible Reinforcing	None
Any Seepage or Efflorescence	Yes
Condition at Joints	No visible movement
Drain holes	None apparent
Channel	
Loose Rock or Trees Overhanging Channel	Some trees but not significant because channel is wide.
Condition of Discharge Channel	Good

PERIODIC INSPECTION CHECKLIST

PROJECT Baltic Mills Dam, N.H. DATE November 8, 1978

PROJECT FEATURE Spillway Weir NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u>	
a. Approach Channel	
General Condition	Good
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Not visible beneath reservoir surface
b. Weir and Training Walls	
General Condition of Concrete	Fair - north side concrete - spalling with portions eroded away, weir - limited visibility but appears to be in fair condition.
Rust or Staining	Little visible above waterline.
Spalling	On training walls at water surface.
Any Visible Reinforcing	None
Any Seepage or Efflorescence	Substantial in south training wall at gate structure.
Drain Holes	None visible
c. Discharge Channel	
General Condition	Good
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	Some trees overhanging but not significant because channel is wide.
Floor of Channel	Covered with boulders, where visible beneath tailwater surface.
Other Obstructions	None

PROJECT Baltic Mills Dam

DATE November 8, 1978

PROJECT FEATURE Reservoir

NAME D. Ford

AREA EVALUATED	REMARKS
Stability of Shoreline	Good
Sedimentation	Not visible
Changes in Watershed Runoff Potential	None
Upstream Hazards	None
Downstream Hazards	Baltic Mill building; bridge just down- stream.
Alert Facilities	None
Hydrometeorological Gages	None
Operational & Maintenance Regulations	None posted



APPENDIX B
ENGINEERING DATA

Anderson-Nichols
189 N. Main St.
Barre, Vt.

Attn: Douglas H. Ford Engineer

Dear Sir:

It is true, we are the present owners of the Baltic Mill Dam in Endfield, N.H. The dam is a small one, with only an 8 ft. head, with relatively small back-water. Water flow in the river is controlled by several lakes upstream from our mill-site.

To answer your questions.

1. We may use the existing water-wheel for our own use after needed overhaul.
2. There are no generators connected at this time.
3. Water levels should not vary appreciably as there is so little backwater. Water not used would go over dam anyway. No operating procedures anticipated.
4. Maintenance: Mill pond was drained during summer and dam inspected. Both gates function properly. Dam structure looks good. Drain gate needs re-inforcing of vertical lift section which we plan to accomplish during summer low-water. This in no way presents a hazard because it is only used during draining of the pond, and hydraulic pressure holds gate closed. No other maintenance has been performed outside of chaining and pad-locking controls to prevent vandalism, and rebuilding & locking gate in chain link fence on approach.
5. No warning system has ever been in existence that we know of. Either myself or my son is usually available - about 1 hour driving.
6. No known deficiencies. Dam is heavy concrete. Construction interlocks are well in place.
7. Dam is well constructed. We do not have construction blueprints.

Feel free to contact us anytime. Pertinent advice would be appreciated.

Sincerely,



Warren H. Taylor
R.F.D.
Rutland, Vt. 05701

Anderson-Nichols

189 North Main Street
Barre, Vermont 05641
(802) 476-6701

December 27, 1978

Mr. Warren Taylor
R.F.D.
Rutland, Vermont 05701

Dear Sir:

The engineering firm of Anderson-Nichols & Co., Inc. has been engaged by the U.S. Army Corps of Engineers to conduct an inspection of the Baltic Mills Dam in Enfield, New Hampshire. The inspection of the dam has been authorized by the Dam Inspection Act, Public Law 92-367.

The records at the New Hampshire Water Resources Board indicate that you are the present owner of the Baltic Mills Dam. It would be appreciated if you could provide us with the following information:

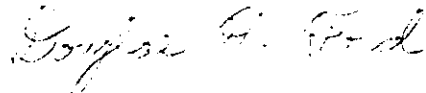
1. Any existing plans of the dam you may have.
2. If there are any generators.
3. Operating procedures of the dam with respect to water levels maintained.
4. Any maintenance on the dam within past few months.
5. Is there a warning system, alert procedures, and availability of a dam tender.
6. Known deficiencies in the structure or channel.
7. Other pertinent data.

If you are no longer the owner, any of the information you may have would still be appreciated along with the present owner's name and address.

If you have any questions please feel free to contact Doug Ford at 802-476-6701.

Sincerely yours,

Anderson-Nichols & Co., Inc.



Douglas H. Ford
Engineer

NEW HAMPSHIRE WATER RESOURCES BOARD

INSPECTION REPORT

Town: Enfield Dam Number: 77.02

Name of Dam, Stream and/or Water Body: Muscongus River

Owner: _____ Telephone Number: _____

Mailing Address: _____

Max. Height of Dam: 17 Pond Area: 5A Length of Dam: 150'

FOUNDATION: _____

OUTLET WORKS: _____

103± O-G concrete spillway 5.5' Feaknot
Waste gates 4' Square 13.5' Below crest
Wheel

ABUTMENTS: Concrete with 3" Steel pins for wood flack

EMBANKMENT: _____

Note: Give Sizing, Condition and Detailed Description for each item.

SPIGWAY: Length: 105 Freeboard: 5.5'

SEEPAGE: Location, estimated quantity, etc.

Changes Since Construction or Last Inspection:

Tail Water Conditions:

Overall Condition of Dam: Good

Contact With Owner: No

Date of Inspection: 1 June 77 Suggested Reinspection Date _____

Class of Dam: Minor

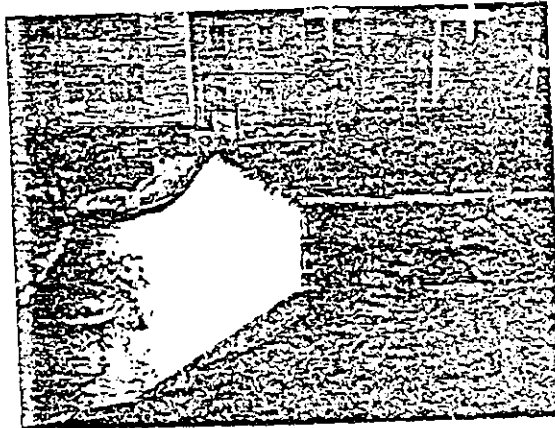
Signature J. Buratt

Date _____

Note: Give Sizing, Condition and detailed description for each item, if applicable.

COMMENTS:

The dam is good shape. The dam has no
Flashboards at this time. The crest is in good shape.
Concrete on the waste gate area is spalling off.
The Trash racks appear to be plugged and operation of gate
and wheel appear to be doubtful.



NEW HAMPSHIRE WATER RESOURCES BOARD

QUESTIONNAIRE

WATER POWERS OF NEW HAMPSHIRE

American Woolen Company
 Enfield
 New Hampshire

Gentlemen:

We maintain in this office a list of the water power installations in New Hampshire. In recent months we have had several inquiries concerning the water power installations in the State and have found that our information is in some cases out of date.

We are, therefore, bringing this information up to date and request your cooperation by filling in the questionnaire below with data on your development, and return it to us in the enclosed stamped envelope.

Very truly yours,

R. S. Holmgren
 Richard S. Holmgren
 Chief Engineer

RSH:GMB
 Encl.

Dam No. 77.02 : Location: Mascoma River at: Enfield

1. Will you please check or correct:

Battle Mill

	Our Data	Your Corrections
Drainage Area - Sq.Mi.	131	
Head - feet	14	
Capacity	253	
Wheel - H.P.		240 P.
Generator - K.W.		240 K.W.

2. Is the power plant now in operation? yes
3. If not, is the equipment in operable condition? —
4. Is the dam in good repair? yes

(Signed)

Date

7/17/42

J. A. Campbell
 Supervising Engr.
 Am. Woolen Co.

NEW HAMPSHIRE WATER CONTROL COMMISSION
DATA ON DAMS IN NEW HAMPSHIRE

LOCATION STATE NO. 77.02

Town Enfield County Grafton

Stream Mascoma River

Basin-Primary Conn. R. Secondary Mascoma River

Local Name Baltic Mill Dam

Coordinates—Lat. 43° 40' -8,800 Long. 73° 10' -8500

GENERAL DATA

Drainage area: Controlled Sq. Mi.: Uncontrolled Sq. Mi.: Total 131 Sq. Mi.

Overall length of dam 120 ft.: Date of Construction 1918-1919

Height: Stream bed to highest elev. 20.5 ft.: Max. Structure 17 ft.

Cost—Dam Reservoir

DESCRIPTION O Gee Face- Concrete

Waste Gates

Type

Number 1 Size 4 ft. high x 4 ft. wide

Elevation Invert 15.6 Total Area 16 sq. ft.

Hoist

Waste Gates Conduit

Number Materials

Size ft.: Length ft.: Area sq. ft.

Embankment

Type

Height—Max. ft.: Min. ft.

Top—Width Elev. ft.

Slopes—Upstream on Downstream on

Length—Right of Spillway Left of Spillway

Spillway

Materials of Construction Concrete

Length—Total ft.: Net 10.5 ft.

Height of permanent section—max. ft.: Min. ft.

Flashboards—Type Height 2.5 ft.

Elevation—Permanent Crest 792.8 Top of Flashboard

Flood Capacity 2800 cfs.: 21.5 cfs/sq. mi.

Abutments

Materials: Concrete

Freeboard: Max. 3.5 ft.: Min. ft.

Headworks to Power Devel.—(See "Data on Power Development")

OWNER American Woolen Co. Enfield N. H.

REMARKS Power- Woolen Mill

Tabulation By A. A. N. & R. L. T. Date November 29, 1936

NEW HAMPSHIRE WATER CONTROL COMMISSION
DATA ON WATER POWER DEVELOPMENTS IN NEW HAMPSHIRE

LOCATION AT DAM NO. 77.02
 Town Enfield : County Grafton
 Stream Mascoma River
 Basin-Primary Conn : Secondary Mascoma
 Local Name Baltic Mills

GENERAL DATA

Head-Max 14 ft. : 14 ft. : 14 ft.
 Date of Construction : Use of Power Industrial
 Pondage : ac. ft. : Storage :

DESCRIPTION

Racks

Size of Rack Opening :
 Size of Bar : Material :
 Area: Gross : Sq. Ft. : Net :

Head Gates

Type :
 Number : Size : ft. high x : ft.
 Elevation of Invert : Total Area :
 Hoist :

Penstock

Number : Material :
 Size : Length :

Turbines

Number 1 : Makers 59" Hercules Horiz
 Rating HP. per unit : Total Capacity 240
 Max. Dement C.F.S., per unit : Total :

Drive

Type :

Generator

Number 2
 Make G.E. 1-75 K.W. 125 V. 600 A. 350 R.P.M. D.C.
 Rating KW., per unit 1-720 K V A. 600 V. 289 A. 720 R P M A.C.
 Total Capacity 240

Exciter

Number : Make :
 Rating-per unit : Total Capacity :

OUTPUT—KWHRS

19.....	19.....
19.....	19.....
19.....	19.....
19.....	19.....
19.....	19.....

OWNER American Poolen Co. Enfield N.H.

Tabulation By A.A.N. & R.L.T. Date November 29, 1938.

Rec'd 10/26/38

Jackson	
W. C. C.	/
State of N. H.	
Concord	
October 12, 1938	
Enclosed	
File No.	

WATER CONTROL COMMISSION
STATE OF NEW HAMPSHIRE

Concord, New Hampshire

October 12, 1938.

American Woolen Co.,
Enfield, N. H.

RE: Am Woolen Co Dam. W. C. C. No. 77.02

Gentlemen:

In order that we may determine the magnitude and extent of the flood of September 21-24 just passed, we are requesting the various dam owners in the State to supply us with the following information:

1. Was this dam injured? Ans. No injury to dam but embankment between dam & Railroad badly washed away.
2. If so, to what extent? Ans. _____
3. Did all flashboards go out? Ans. about half went out.
4. What was the maximum height of water over the permanent crest of spillway? Ans. 55"
5. At what day and hour did the maximum flood height reach your dam? Ans. 9:00 A.M. September 23, 1938

6. Any other interesting information regarding the flood or rain fall may be given on the back of this sheet, or attach sheets.

Will you please return this letter with as much information as you can give us as promptly as possible. A self-addressed envelope is attached hereto.

We thank you for your cooperation.

Very truly yours,

Richard S. Holmgren

Richard S. Holmgren
Chief Engineer

CDC:GMB
Enc.

NEW HAMPSHIRE WATER RESOURCES BOARD

INVENTORY OF DAMS AND WATER POWER DEVELOPMENTS

DAM

BASIN Connecticut NO. 2 77.02 I 782 (1)
 RIVER Mascoma MILES FROM MOUTH 13.5 D.A.SQ. MI. 128
 TOWN Enfield OWNER American Woolen Co.
 LOCAL NAME OF DAM Baltic Mills
 BUILT 1919 DESCRIPTION Concrete

POND AREA-ACRES _____ DRAWDOWN FT. _____ POND CAPACITY-ACRE F
 HEIGHT-TOP TO BED OF STREAM-FT. 10 20.5 MAX. _____ MIN. _____
 OVERALL LENGTH OF DAM-FT. 100 710 MAX. FLOOD HEIGHT ABOVE CREST-FT. _____
 PERMANENT CREST ELEV. U.S.G.S. 792.81 LOCAL GAGE _____
 TAILWATER ELEV. U.S.G.S. 777.91 LOCAL GAGE _____
 SPILLWAY LENGTHS-FT. 100 103 FREEBOARD-FT. 5.5 left 2.5 right
 FLASHBOARDS-TYPE, HEIGHT ABOVE CREST 2.5
 WASTE GATES-NO. WIDTH MAX. OPENING DEPTH SILL BELOW CREST
1 4.0 4.0 13.6

REMARKS Condition Fair - good.
3 G. Mouth Mascoma R. 288.95 mi from Mouth Connecticut R.

POWER DEVELOPMENT

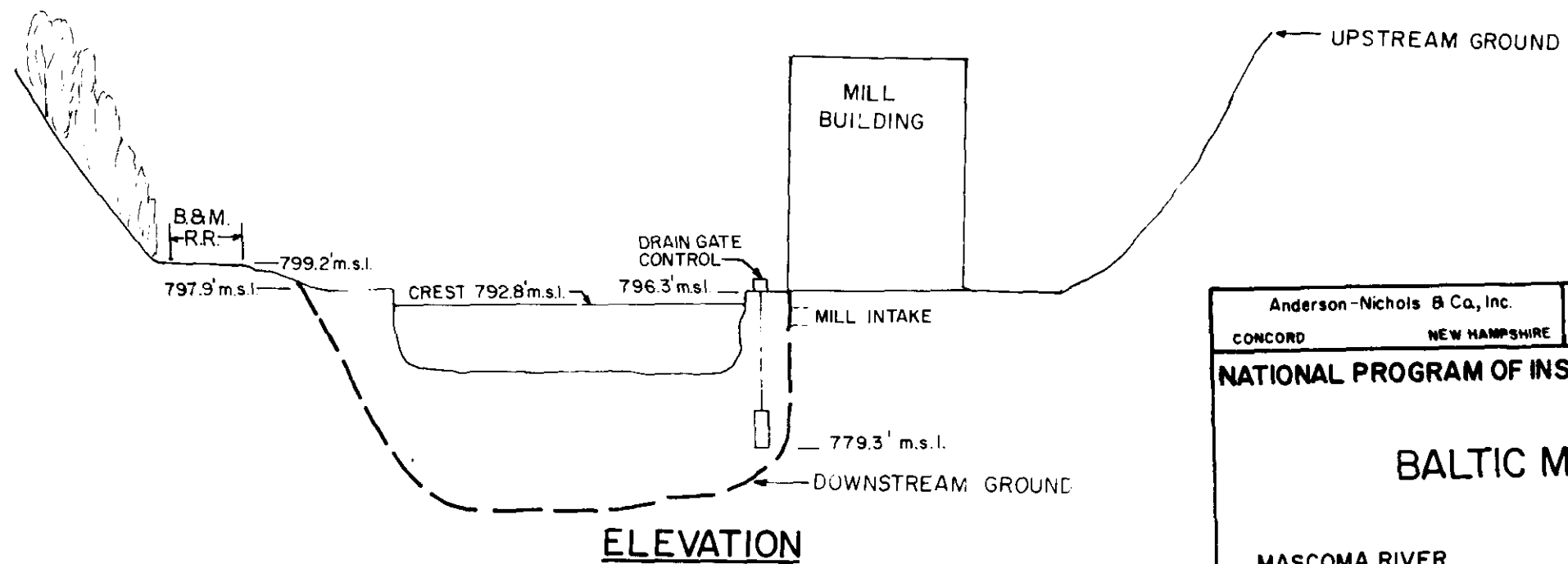
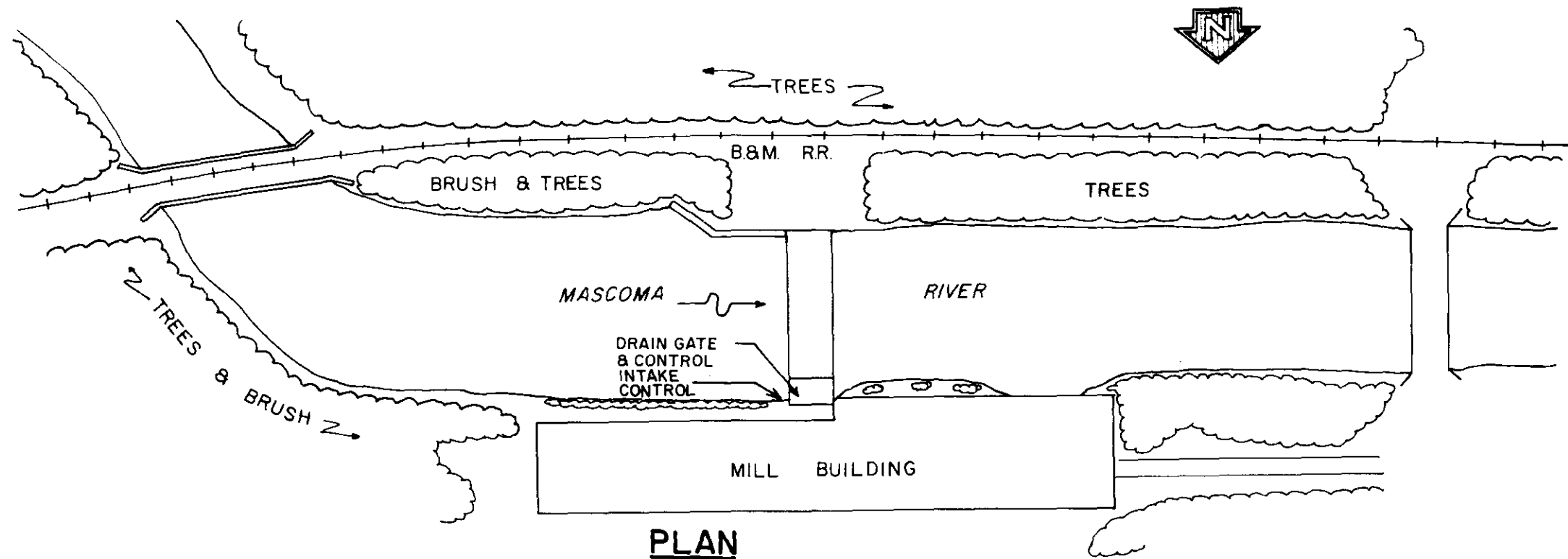
UNITS	NO.	RATED HP	HEAD FEET	C.F.S. FULL GATE	KW	MAKE
<u>Est.</u>	<u>180</u>	<u>149</u>				
	<u>200</u>	<u>147</u>				
	<u>240</u>	<u>140</u>			<u>75 KW</u>	<u>G.E. 175V 600A 350K</u>
	<u>253</u>	<u>14</u>			<u>300 KVA</u>	<u>G.E. 600V 289A 72-21</u>
						<u>39" Hercules Horiz</u>

Mortensen
 USE Power for woolen mill

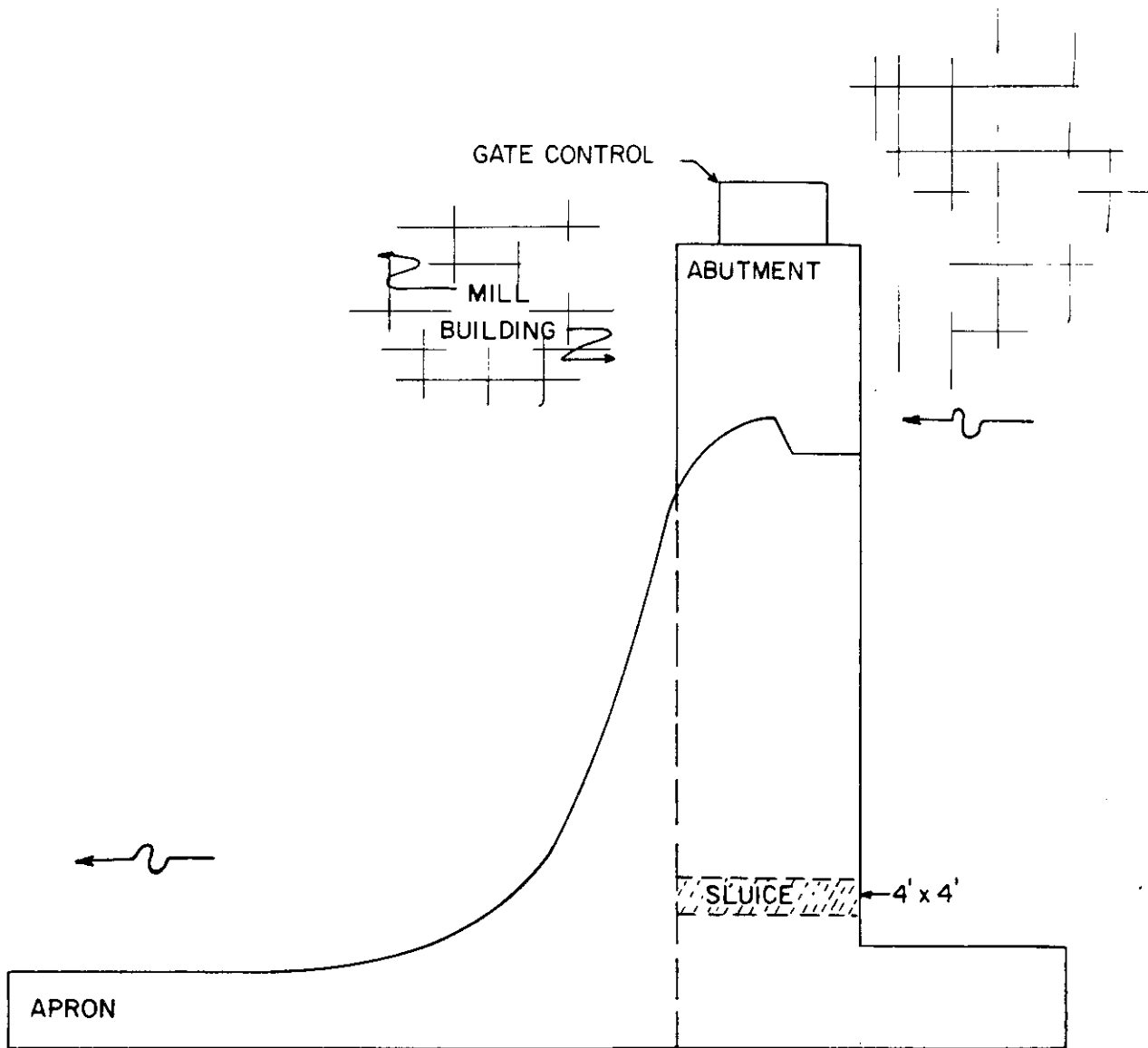
REMARKS Primary HP 90% of Time 210.45
Talked to R.W. Mortensen, Resident Agent who gave information
power installation from report by Chas. T. Main, Consulting En.
Boston, Mass. Water wheel drives line shaft + generators are belt
from that. Main report say concrete dam 120' long 12' high to crest.

DATE 1931 AE 1922 PSC

19137 H + J.H.S.



Anderson-Nichols & Co., Inc.		U.S. ARMY ENGINEER DIV. NEW ENGLAND	
CONCORD		CORPS OF ENGINEERS	
NEW HAMPSHIRE		WALTHAM, MASS.	
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS			
BALTIC MILLS DAM			
MASCOMA RIVER		NEW HAMPSHIRE	
		SCALE: NOT TO SCALE	
		DATE: FEBRUARY 1979	



CROSS-SECTION

Anderson-Nichols & Co., Inc.		U.S. ARMY ENGINEER DIV. NEW ENGLAND	
CONCORD		CORPS OF ENGINEERS	
NEW HAMPSHIRE		WALTHAM, MASS.	
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS			
BALTIC MILLS DAM			
MASCOMA RIVER		NEW HAMPSHIRE	
		SCALE: NOT TO SCALE	
		DATE: FEBRUARY 1979	

APPENDIX C
PHOTOGRAPHS

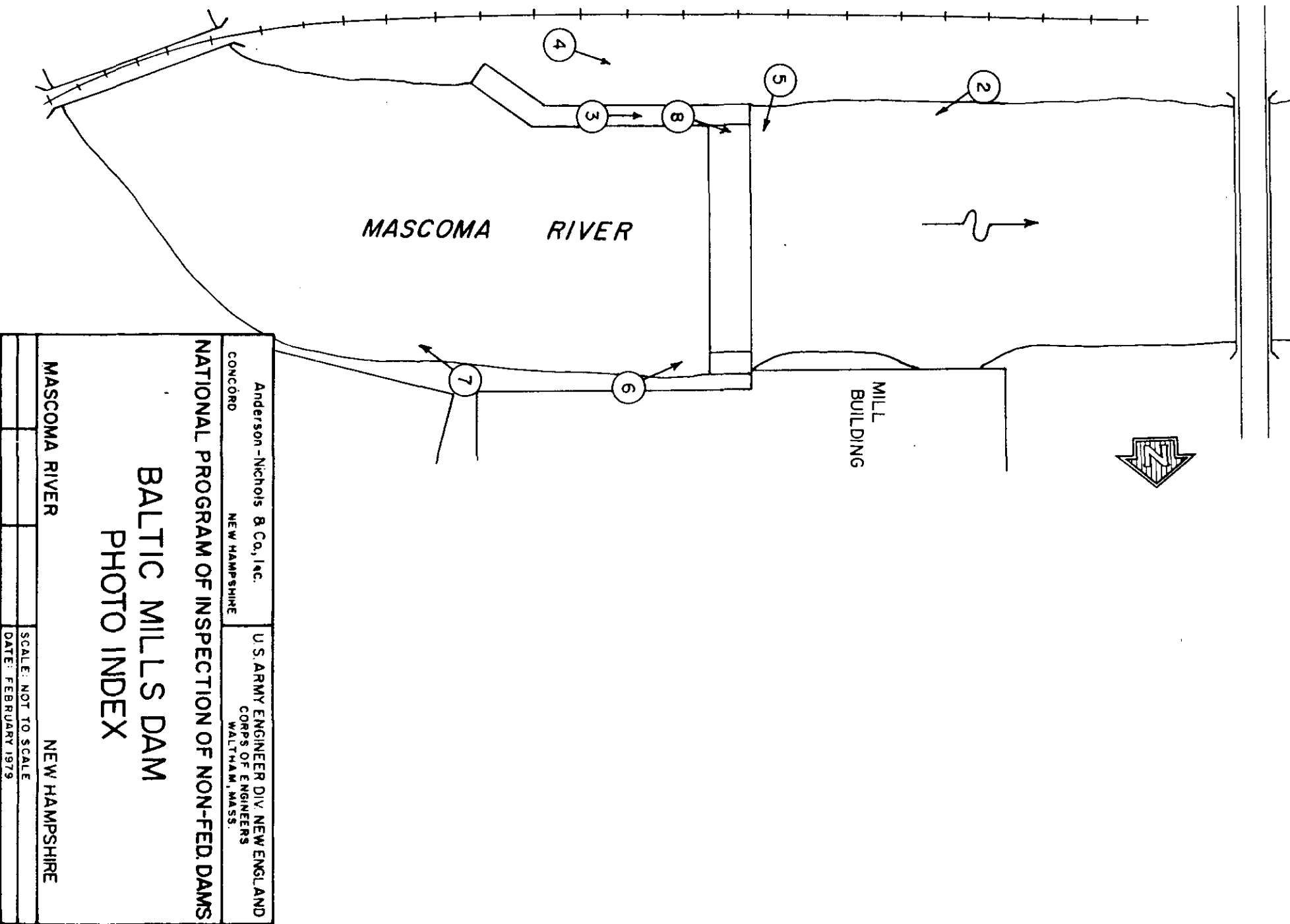




Figure 2 - Looking east at downstream face of dam.



Figure 3 - Looking at cracks in top of training wall at south abutment.



Figure 4 - Looking at rock fill placed between south abutment training wall and natural ground.



Figure 5 - Looking north across downstream face of dam at mill building and drain gate structure.

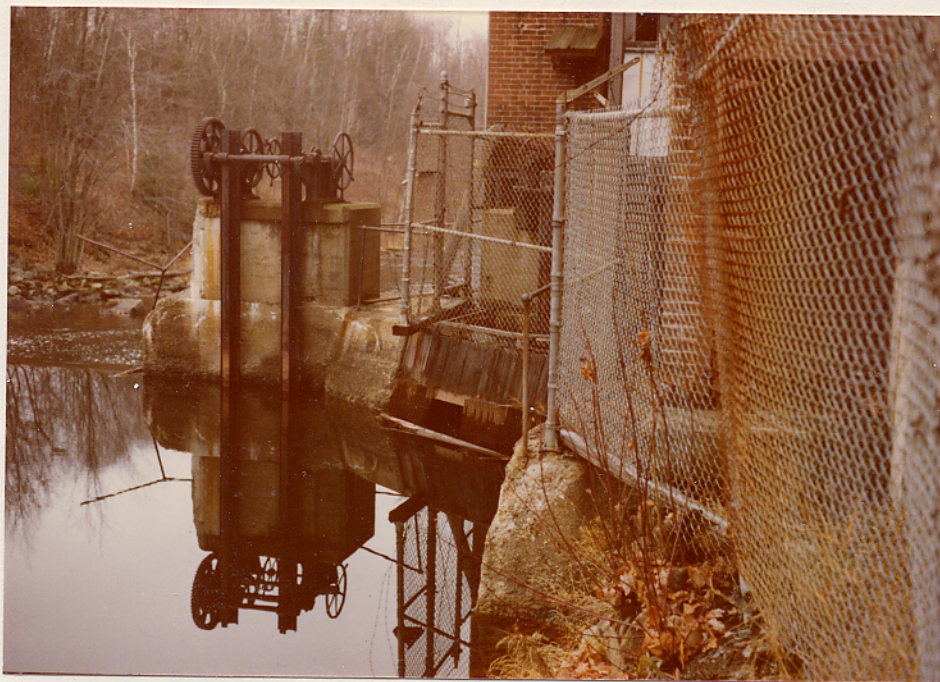


Figure 6 - Looking at inlet to penstock and control to drain gate located on north abutment.



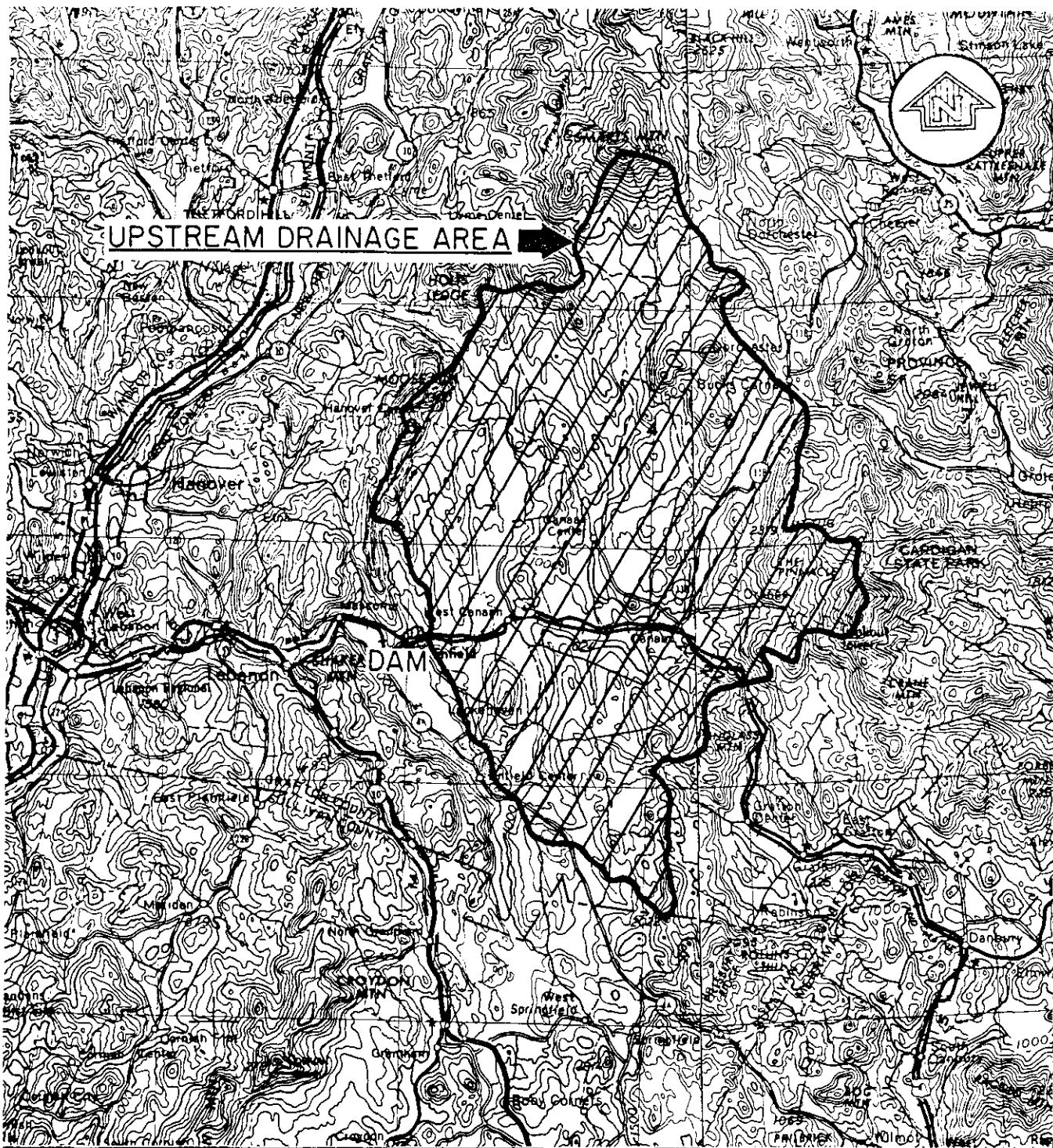
Figure 7 - Looking east at B & M Railroad Bridge located about 300 feet upstream of dam.



Figure 8 - Looking west at downstream channel from south abutment.

Figure 7 - Looking east at B & M Railroad Bridge located about 300 feet upstream of dam.

APPENDIX D
HYDROLOGIC AND HYDRAULIC COMPUTATIONS



**NATIONAL PROGRAM OF INSPECTION
OF NON-FED. DAMS
BALDIC MILLS DAM
ENFIELD, NEW HAMPSHIRE
REGIONAL VICINITY MAP**

DEPARTMENT OF THE ARMY
V ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS
SON-NICHOLS & CO., INC. CONCORD, NH

SCALE IN MILES



MAP BASED ON U.S.G.S. 1:250,000 SERIES
TOPOGRAPHIC MAPPING, GLENS FALLS, N.Y.,
VT., N.H. 1956 REVISED 1972, AND PORTLAND,
ME., N.H. 1956 REVISED 1972.

APPENDIX D

HYDRAULICS & HYDROLOGY

BALTIC MILLS DAM OVERTOPPING ANALYSIS

$$DA = 130 \text{ mi}^2$$

SIZE CLASSIFICATION = SMALL

HAZARD CLASSIFICATION = SIGNIFICANT

TEST FLOOD = $1/4$ PMF

CALCULATE PMF USING "PRELIMINARY GUIDANCE FOR ESTIMATING MAXIMUM PROBABLE DISCHARGES IN PHASE I DAM SAFETY INVESTIGATIONS, MARCH 1

AVERAGE SLOPE OF THE WATERSHED IS 26 FT/MI. & OF STORAGE AREA UPSTREAM, USE ADJUSTED VALUE OF THE 'FLAT & COASTAL' AND 'ROLLING' CURVES.

FROM THE NOTES OF THE 1913 WEST CANADIAN DAM STUDY, PARALLEL RIVERS, I VALUE 0.47 FOR THE FLAT & COASTAL BECAUSE OF THE LOCATION OF THE 80.5 SQ MI WATERSHED IN THE U.S.G.A. GAGE IN WEST CANADA. THIS CURVE LIES IN BETWEEN THE 'FLAT & COASTAL' AND 'ROLLING' CURVES. BECAUSE THIS VALUE WAS FOUND BY A MORE DETAILED STUDY, IT IS THE VALUE THAT WILL BE USED FOR THIS STUDY. THE 'FLAT & COASTAL' CURVE IS WEIGHTED ABOUT 0.22 OVER THE 'ROLLING' CURVE.

$$\begin{array}{ll} \text{FOR 'FLAT & COASTAL'} & CSM = 375 \\ \text{AND 'ROLLING'} & CSM = 345 \end{array}$$

$$0.22(345) + 0.77(375) = 364 \text{ CSM}$$

$$PMF = 130 \text{ mi}^2 \times 364 \text{ CSM} = 47,320 \text{ cfs}$$

$$1/4 \text{ PMF} = 11,830 \text{ cfs} = 16,050 \text{ cfs}$$

REFER TO RATING CURVE: (P. 4)

WITH A DISCHARGE OF 16,055 CFS AN ELEVATION OF 803.2 MSL IS READ. SPILLWAY CREST = 792.8 MSL.

∴ THE SPILLWAY WILL BE OVERTOPPED BY APPROXIMATELY 10.4 FEET DURING THE TEST FLOOD (1/4 PROBABLE MAXIMUM FLOOD)

DETERMINE DISCHARGE RATING CURVE FOR THE DAM USING THE WEIR EQUATION $Q = CLH^{3/2}$, WHERE THE 'C' FOR THE DAM SPILLWAY CREST RANGES FROM 3.6 TO 3.9 & THE 'C' FOR THE ABUTMENTS AND OVERBANKS RANGE FROM 2.6 TO 2.8.

TRIAL #1 @ 792.8 SPILLWAY CREST
 $Q = 0$ CFS

TRIAL #2 @ 793.8
 $Q = 3.6(96)(1)^{3/2} = 346$ CFS

TRIAL #3 @ 795.8
 $Q = 3.7(96)(3)^{3/2} = 1846$ CFS

TRIAL #4 @ 796.3 MAXIMUM POOL
 $Q = 3.7(96)(3.5)^{3/2} = 2326$ CFS

TRIAL #5 @ 798.1 TOP OF LEFT ABUTMENT
 $Q = 3.8(96)(5.3)^{3/2} + 2.8(6)(1.7)^{3/2} = 9988$ CFS

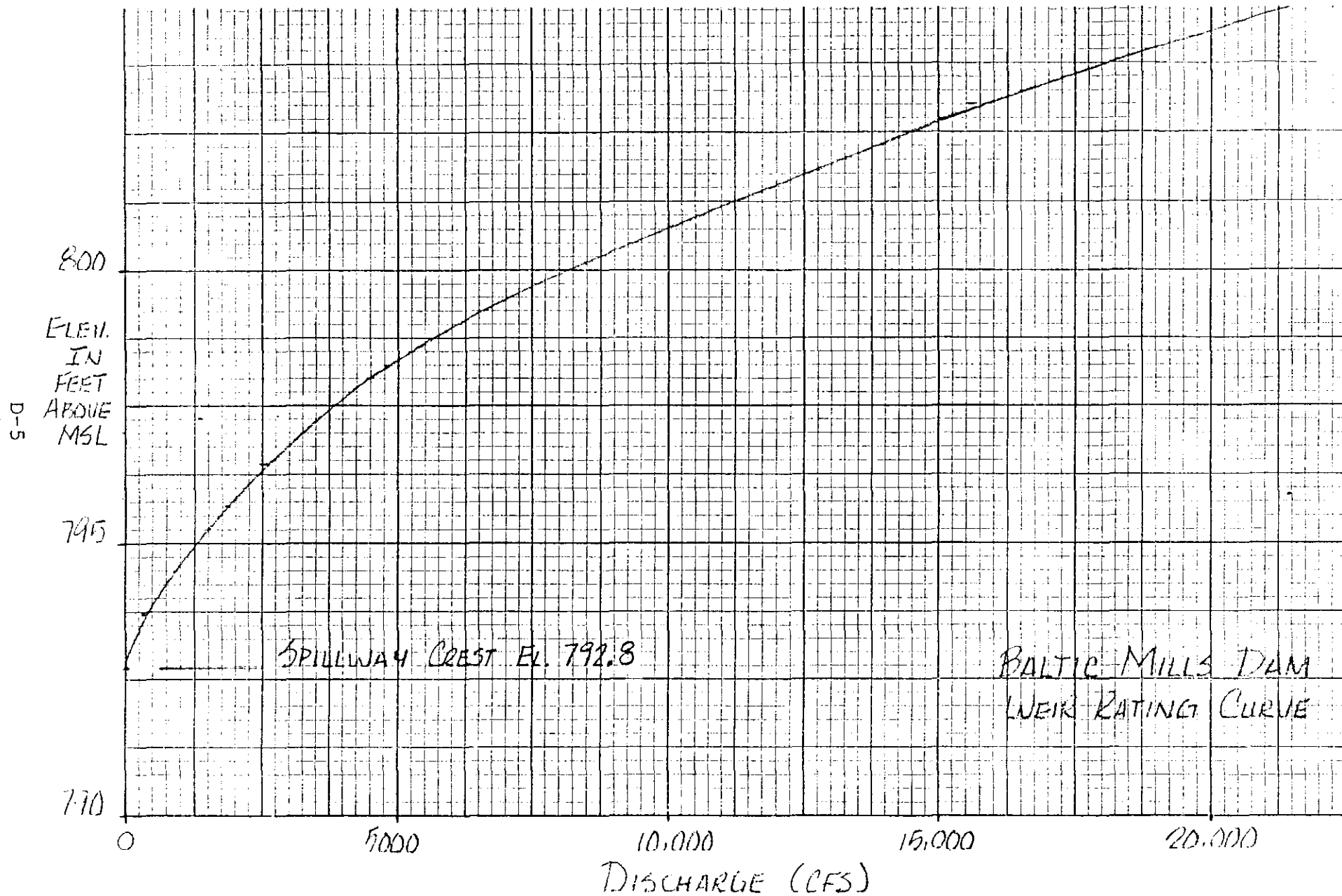
TRIAL #6 @ 803.1

$$Q = 3.9(96)(10.3)^{3/2} + 2.8(6)(6.8)^{3/2} \\ + 2.6(198)(3.9)^{3/2} = 15,638 \text{ cfs}$$

TRIAL #7 @ 805.1

$$Q = 3.9(96)(12.3)^{3/2} + 2.8(6)(8.8)^{3/2} \\ + 2.6(198)(5.9)^{3/2} = 22,109 \text{ cfs}$$

USE THE ABOVE TRIALS TO DEVELOP A DISCHARGE
RATING CURVE FOR BALTIC MILLS DAM.



3. TO: MILLS DAM

BREACH ANALYSIS - TO DETERMINE DOWNSTREAM HAZARD CLASSIFICATION

FOR NORMAL POOL (USING MEAN ANNUAL FLOW): USING W. RESOURCES DATA FOR NEW HAMPSHIRE AND VERMONT, WRI YEAR 1976, U.S. GEOLOGICAL SURVEY - DATA REPORT NH-VT AUGUST 1977:

AT GAGE STATIONS ON MASCOMA RIVER

$$DA = 80.5 \text{ MI}^2 - \text{MEAN ANNUAL FLOW} = 167 \text{ CFS} = 2.07 \text{ C}$$

$$DA = 153.0 \text{ MI}^2 - \text{MEAN ANNUAL FLOW} = 323 \text{ CFS} = 2.11 \text{ C}$$

A 2.07 CFS VALUE IS APPLIED TO DA @ BALTIC MILLS DAM (DA = 130 SQ-MI). \therefore MEAN ANNUAL FLOW = $130 \times 2.07 = 269 \text{ CFS}$
THIS GIVES ABOUT 0.9 FOOT DEPTH OVER SPILLWAY.

$$Q_D = 8/27 W_b \sqrt{g} y_2^{3/2}$$

$$W_b = \text{BREACH WIDTH}$$

$$g = 32.2 \text{ FT/SEC}^2$$

$$y_2 = \text{POOL ELEV} - \text{U/S RIVER BED}$$

793.6' MSL OF 0.9' OVER SPILLWAY CREST. UPSTREAM RIVER BED IS AT ELEVATION 782.9' MSL

② BALTIC MILLS DAM

$$W_b = 96 \times 0.90 = 38 \text{ FT}$$

$$y_2 = 793.6 - 782.4 = 11.2 \text{ FT}$$

FROM EQUATION: $Q = 2395 \text{ CFS}$

Q OVER DAM OTHER THAN BREACHED AREA: $Q = 8.6(53)(0.9)^{3/2} =$

$$\text{TOTAL BREACH } Q = 2395 + 178 = 2573 \text{ CFS}$$

FOR MAXIMUM POOL: MAXIMUM POOL ELEVATION = 796

BALTIC MILLS DAM

$$W_b = 96 \times 0.40 = 38.4 \text{ FT}$$

$$y_o = 796.4 - 782.4 = 14.0'$$

$$\text{MOM EQUATION: } Q = 3347 \text{ CFS}$$

$$\text{OVER DAM OTHER THAN BREACHED AREA: } Q = 3.7(58)(3.7)^{3/2} = 1527 \text{ CFS}$$

$$\text{TOTAL BREACH } Q = 3347 + 1527 = 4874 \text{ CFS}$$

A TYPICAL X-SECTION ALONG THE DOWNSTREAM REACH
FROM THE DAM TO THE BRIDGE 1300 FT DOWNSTREAM.
USING THE FOLLOWING MANNING'S EQUATION:

$$Q = 1.49/n A R^{2/3} S^{1/2}$$

n = COMPOSITE "n" VALUE

A = AREA OF SECTION

R = A/P (WETTED PERIMETER)

S = SLOPE

$$\text{LENGTH OF REACH} = 1300'$$

$$\text{ELEVATION @ D/S TOE} = 779'$$

$$\text{ELEVATION @ END OF REACH} = 775'$$

$$\text{SLOPE} = 0.0031$$

$$\text{COMPOSITE "n"} = 0.05$$

$$\text{FOR A RECTANGULAR SECTION - } Q = \frac{1.49}{0.05} \cdot 1344 \left[\frac{1344}{(1344 \cdot 4)} \right]^{2/3} \cdot 0.0031^{1/2}$$

$$\text{TRIAL \#1 STAGE} = 1 \quad Q = 210 \text{ CFS}$$

$$\text{TRIAL \#2 STAGE} = 2 \quad Q = 673 \text{ CFS}$$

$$\text{TRIAL \#3 STAGE} = 5 \quad Q = 2867 \text{ CFS}$$

$$\text{TRIAL \#4 STAGE} = 7.5 \quad Q = 5317 \text{ CFS}$$

USE THE ABOVE TRIALS TO ESTABLISH A DOWNSTREAM

RATING CURVE

FOR NORMAL POOL:

$$\text{TOTAL BREACH } Q = 2573 \text{ cfs} \rightarrow \text{STAGE} = 4.6'$$

$$\text{ANTECEDENT } Q = 3.6(96)(0.9)^{3/2} = 295 \text{ cfs} \rightarrow \text{STAGE} = 1.2'$$

\therefore In the event of a breach, the increase in stage of the downstream water surge would be $4.6 - 1.2 = \underline{3.4 \text{ feet}}$.

FOR MAXIMUM POOL:

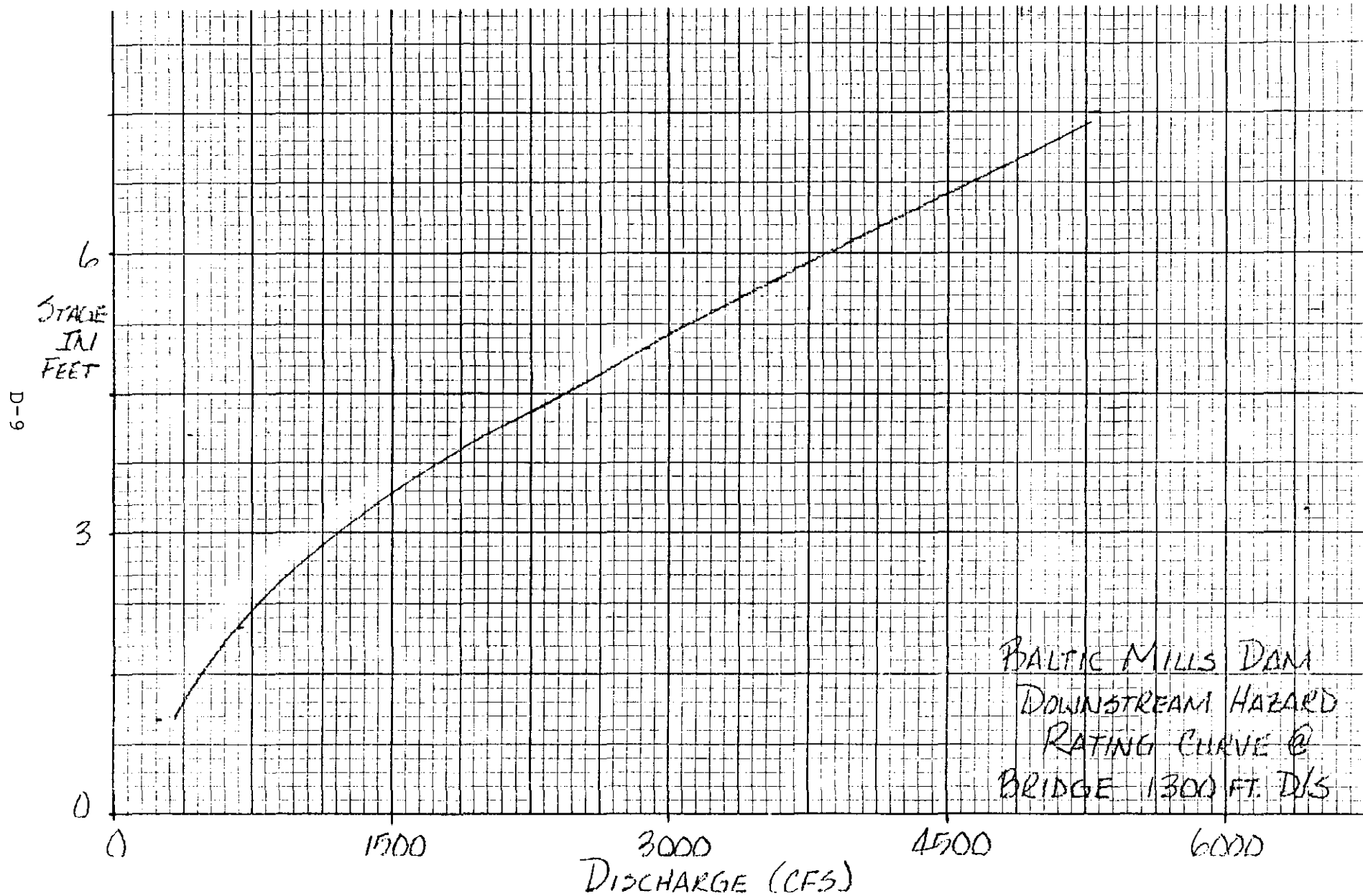
$$\text{TOTAL BREACH } Q = 4874 \text{ cfs} \rightarrow \text{STAGE} = 7.0'$$

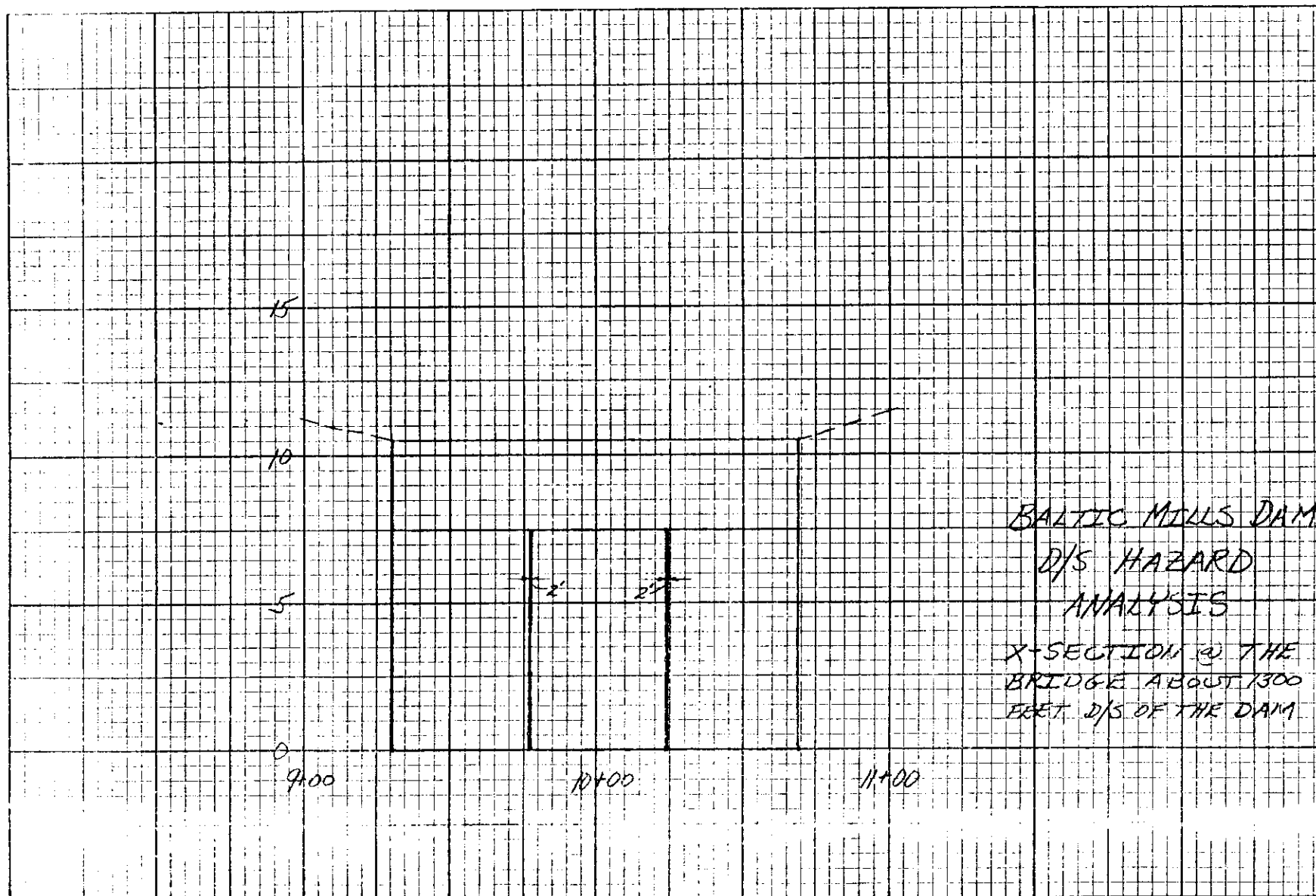
$$\text{ANTECEDENT } Q = 3.7(96)(3.7)^{3/2} = 2530 \text{ cfs} \rightarrow \text{STAGE} = 4.6'$$

\therefore In the event of a breach, the increase in stage of the downstream water surge would be $7.0 - 4.6 = \underline{2.4 \text{ feet}}$.

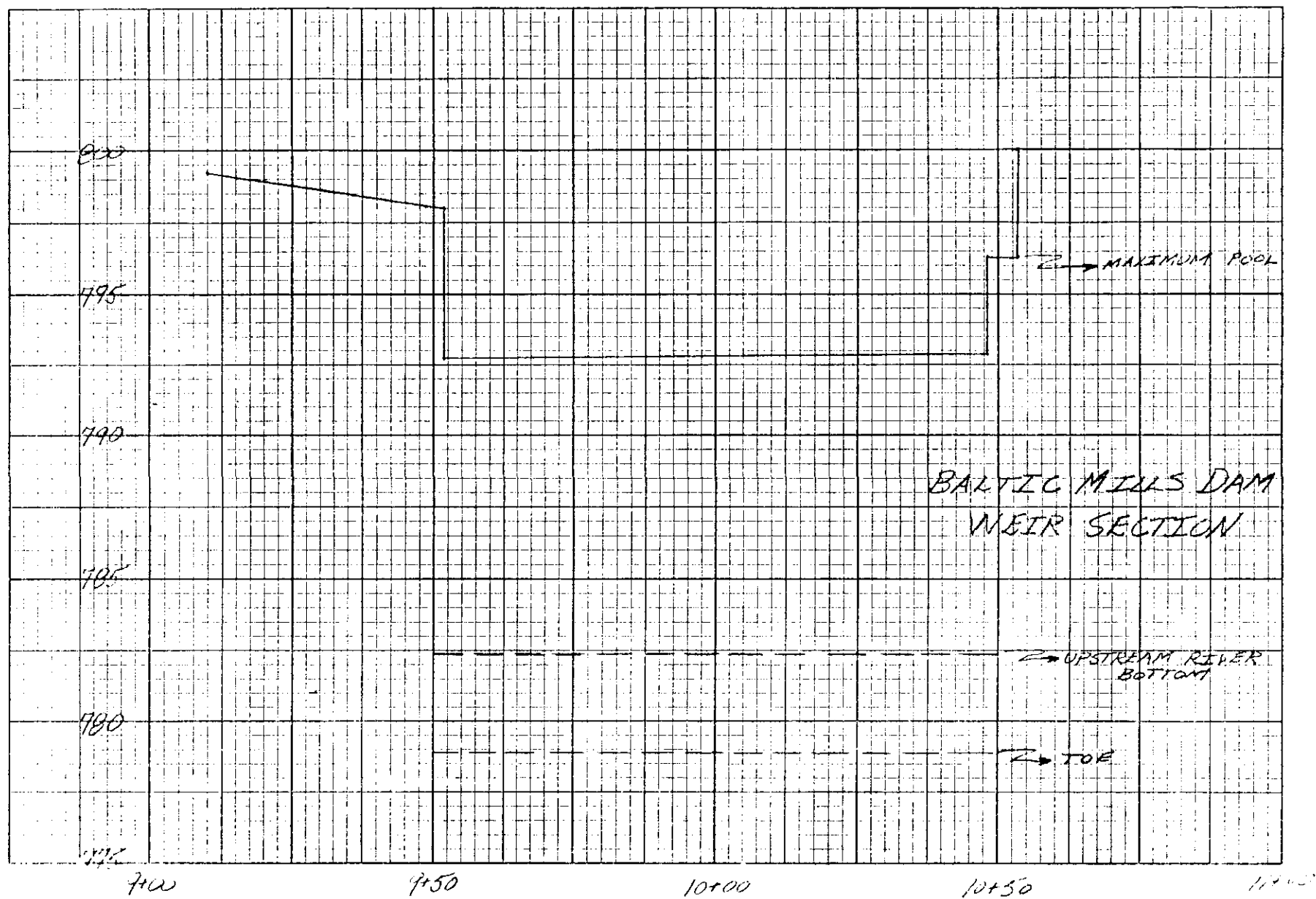
CONCLUSION - HAZARD CLASSIFICATION

Baltic Mills Dam is a significant hazard dam. A bridge crosses the Mascoma River approximately 1300 feet downstream of the dam in a highly developed area. Although no loss of life would be likely, a breach of dam at top of dam elevation would inundate the downstream hazard area and cause appreciable property damage.





D-11



Gate Capacity

Calculate approximate gate capacity
with pool at top of dam elevation.
- 96.3' MSL

Size of opening - 4'H x 4'W
Gate invert - 779.3 $\therefore E \approx 781.3$

Using Orifice equation $Q = CA\sqrt{2gh}$
where 'C' equals 0.7:

$$\begin{aligned} Q &= CA\sqrt{2gh} \\ &= (0.7)(16)\sqrt{64.4 \times 15} \\ &= 348 \text{ cfs} \end{aligned}$$

APPENDIX E

INFORMATION AS
CONTAINED IN THE NATIONAL
INVENTORY OF DAMS

STATE	IDENTITY NUMBER	DIVISION	STATE	COUNTY	CONGRESS DIST.	STATE	COUNTY	CONGRESS DIST.	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY MO YR
NH	273	NED	NH	004	02				HALTIC MILLS DAM	4338.6	7208.1	15 FEB 79

POPULAR NAME	NAME OF IMPOUNDMENT
	MASCOMA RIVER

REGION	BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	DIST FROM DAM (MI.)	POPULATION
11	04	MASCOMA RIVER	ENFIELD	0	2345

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCTURAL HEIGHT (FT.)	HYDRAULIC HEIGHT (FT.)	IMPOUNDING CAPACITIES	
					MAXIMUM (ACRE-FT.)	NORMAL (ACRE-FT.)
CING	1919	HS	21	17	220	120

DIST OWN FED R PRV/PED SCS A VER/DATE
NED N N N N 07MAR79

REMARKS

D/S BAS	SPILLWAY		MAXIMUM DISCHARGE (FT.)	VOLUME OF DAM (CY)	POWER CAPACITY		NAVIGATION LOCKS											
	CREST LENGTH	TYPE			WIDTH (FT.)	INSTALLED (MW)	PROPOSED (MW)	NO.	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)				
2	120		96	2530														

OWNER	ENGINEERING BY	CONSTRUCTION BY
NH WARREN H TAYLOR		

REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NHWRB	NHWRB	NHWRB	NHWRB

INSPECTION BY	INSPECTION DATE DAY MO YR	AUTHORITY FOR INSPECTION
ANDERSON-NICHOLS + CO INC.	09NOV78	PL-92-367

REMARKS